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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/784,751	02/23/2004	Timothy Daniel Kostar	13DV-14085 (07783-0113)	2241
31450	7590	06/06/2006	EXAMINER	
MCNEES WALLACE & NURICK LLC 100 PINE STREET P.O. BOX 1166 HARRISBURG, PA 17108-1166			MATZEK, MATTHEW D	
			ART UNIT	PAPER NUMBER
			1771	

DATE MAILED: 06/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/784,751	Applicant(s) KOSTAR ET AL.	
	Examiner Matthew D. Matzek	Art Unit 1771	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 and 28-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 and 28-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Amendment

1. The amendment dated 3/9/2006 has been fully considered and entered into the Record. Claims 21-27 have been canceled and new claims 28-31 have been added. The new claims contain no new matter. Claims 1-20 and 28-31 are currently active. The previously applied double patenting rejection has been withdrawn as application 10/703,272 failed to claim a ceramic matrix composite laminate.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-20 and 21-31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The new limitation of a “dry, porous layer of [a] nonwoven mat” is indefinite as it is confusing to Examiner as to whether Applicant is describing an intermediate or final product. The Examiner has and continues to interpret the claimed invention to comprise dry fibers in a dry matrix, however Examiner is confused as to whether the mat or the matrix or its combination is supposed to be dry. Examiner interprets the mat, the matrix and its combination to be dry and porous.
3. Claims 29-31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 29-31 are dependent upon canceled claim 27. Examiner has interpreted claims 29-31 to be dependent upon independent claim 28.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 5-11, 14, 15, 17, 18 and 28-31 are rejected under 35 U.S.C. 102(b) as being anticipated by Hillig et al. (US 4,917,941).

a. Hillig et al. teach a fiber and a filament containing ceramic perform comprised of a mixture of discontinuous fibers surrounding a layer of continuous filaments extending through the mixture. The mixture is produced by and infiltrated with a molten ceramic to produce a composite (Abstract). The continuous fibers provide reserve strength to the composite should it crack and the discontinuous fibers provide toughness to the composite (col. 1, line 61-col. 2, line 12). The discontinuous fibers may be chopped silicon carbide fibers or a mixture of different ceramic fibers (col. 3, lines 1-20). The continuous fibers may be made of silicon carbide or a mixture of different ceramic fibers (col. 5, lines 43-49). As demonstrated in the Examples of Hillig the final product of Hillig is dry and porous and therefore anticipates the new limitations.

b. The structure of the applied article has a layer containing a plurality of continuous ceramic filaments adjacent a layer of chopped ceramic fibers located in a continuous matrix phase which is adjacent another layer containing a plurality of continuous ceramic filaments (claim 5). A number of chemical species are available for use as the infiltrant to create the continuous matrix including ceramics (col. 4, lines 1-14). The Examiner takes the position that the chopped ceramic fibers that are located in the applied

invention's matrix constitute a nonwoven mat of chopped fibers. This is based upon the fact that the matrix contains a plurality of fibers, which are bound together by the matrix creating a mat. Therefore, the applied article constitutes a plurality of continuous ceramic fiber layers (lamina) each separated by a layer of ceramic matrix that has a nonwoven mat layer of chopped ceramic fibers within it. The continuous matrix phase is to be distributed evenly throughout the composite to create the instantly claimed infiltrated article (col. 11, lines 6-13). Claim 5 is rejected as the ceramic fibers may have a length of from about 10 to about 2000 microns (0.0004 to 0.08 inches) (col. 3, lines 13-15). Claim 14 is rejected as the ceramic chopped fibers have diameters up to 10 microns (0.0004 inches) (col. 3, lines 10-15).

c. Claims 8-11 are rejected as the matrix phase of the applied invention is designed to fill the space the between adjacent layers of continuous filaments thereby reducing the number of inter-laminar voids, size and volume fraction of said voids. The continuous matrix is to be distributed evenly throughout the composite and as such would evenly distribute the inter-laminar voids.

5. Claims 1, 6, 8-11 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Fareed et al. (US 2002/0058107).

a. Fareed et al teach a composite comprising adjacent plies of fiber tows/bundles (e.g. silicon carbide fiber) separated by a continuous ceramic matrix [0122, 0123].

Within the matrix chopped silicon carbide fibers may be added [0126]. The Examiner takes the position that the chopped ceramic fibers that are located in the applied invention's matrix constitute a nonwoven mat of chopped fibers. This is based upon the

fact that the matrix contains a plurality of fibers, which are bound together by the matrix creating a mat. Therefore, the applied article constitutes a plurality of continuous ceramic fiber layers (lamina) each separated by a layer of ceramic matrix that has a nonwoven mat layer of chopped ceramic fibers within it.

b. Claims 8-11 are rejected as the matrix phase of the applied invention is designed to fill the space the between adjacent layers of continuous filaments thereby reducing the number of inter-laminar voids, size and volume fraction of said voids. The continuous matrix is to be distributed evenly throughout the composite and as such would evenly distribute the inter-laminar voids.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-18 and 28-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tani (US 2003/0145934) in view of Hillig et al. (US 4,917,941).

a. Tani teaches a process for producing a fiber-reinforced silicon carbide composite offering high toughness comprising a multiple layer laminate (Abstract). Woven, nonwoven and unidirectional prepregs of silicon carbide fiber are available to reinforce the silicon carbide matrix [0014, 0015]. The spaces between the layers of the composite are filled with polymeric resins and silicon. Following heat-treatment the two components form a porous silicon carbide matrix spanning the void between adjacent

layers of the laminate (Abstract, 0006]. The laminate of Example 3 comprises two layers of nonwoven and two layers of woven silicon carbide fabrics laminated in alternating order creating a laminate combination of nonwoven/woven/nonwoven/woven.

Unidirectional fiber preregs, which comprise continuous fibers, may replace the woven fabric layers [0014]. Replacing the woven fabric layers of Example 3 with unidirectional fiber prepreg layers creates a ceramic matrix composite laminate with a nonwoven layer in between two layers of unidirectional fiber prepreg. The invention of Tani is silent as to the use of chopped ceramic fibers in the creation of the nonwoven fabric layer.

b. Hillig et al. teach a fiber and a filament containing ceramic perform comprised of a mixture of discontinuous fibers surrounding a layer of continuous filaments extending through the mixture. The mixture is produced by and infiltrated with a molten ceramic to produce a composite (Abstract). The continuous fibers provide reserve strength to the composite should it crack and the discontinuous fibers provide toughness to the composite (col. 1, line 61-col. 2, line 12). The discontinuous fibers may be chopped silicon carbide fibers or a mixture of different ceramic fibers (col. 3, lines 1-20). The continuous fibers may be made of silicon carbide or a mixture of different ceramic fibers (col. 5, lines 43-49).

c. The structure of the applied article has a layer containing a plurality of continuous ceramic filaments adjacent a layer of chopped ceramic fibers located in a continuous matrix phase which is adjacent another layer containing a plurality of continuous ceramic filaments (claim 5). A number of chemical species are available for use as the infiltrant to create the continuous matrix including ceramics (col. 4, lines 1-14). The continuous

matrix phase is to be distributed evenly throughout the composite to create the instantly claimed infiltrated article (col. 11, lines 6-13). Claim 5 is rejected as the ceramic fibers may have a length of from about 10 to about 2000 microns (0.0004 to 0.08 inches) (col. 3, lines 13-15). Claim 14 is rejected as the ceramic chopped fibers have diameters up to 10 microns (0.0004 inches) (col. 3, lines 10-15).

d. Claims 8-11 are rejected as the matrix phase of the applied invention is designed to fill the space the between adjacent layers of continuous filaments thereby reducing the number of inter-laminar voids, size and volume fraction of said voids. The continuous matrix is to be distributed evenly throughout the composite and as such would evenly distribute the inter-laminar voids.

e. Since Tani and Hillig et al. are from the same field of endeavor (i.e. fiber-reinforced silicon carbide composites), the purpose disclosed by Hillig et al. would have been recognized in the pertinent art of Tani.

f. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to have made the nonwoven layers of Tani with the chopped ceramic fibers of Hillig et al. The skilled artisan would have been motivated by the desire to provide the composite with toughness (col. 1, line 61-col. 2, line 12, Hillig et al.).

g. Tani and Hillig et al. disclose the claimed invention except for the instantly claimed nonwoven mat thickness. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the nonwoven mat layer between 0.001 and 0.002 inches thick, since it has been held that where the general

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conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Therefore, claims 2 and 3 are rejected.

h. Claim 4 is rejected as it would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the nonwoven mat layer with randomly oriented chopped fibers. The skilled artisan would have been motivated to use said fibers, because randomly oriented fibers within the continuous matrix would have afforded the matrix thermal, mechanical, and electrical enhancement that is isotropic. Isotropic properties afford the nonwoven layer minimized thermal and mechanical stresses that occur when there is a mismatch between phases of a composite.

i. Tani and Hillig et al. disclose the claimed invention except for the instantly claimed nonwoven mat porosity. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the nonwoven mat layer with porosity of about 80 to 90 percent, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Therefore, claims 12 and 13 are rejected.

7. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tani (US 2003/0145934) in view of Hillig et al. (US 4,917,941) as applied to claim 1 above, and further in view of Colegrove et al. (US 6,096,669). The invention of Tani and Hillig et al. are silent as to the use of multiple layers between the continuous fiber perform lamina.

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- a. Colegrove et al. teach a preform suitable for use in creating a composite laminate (Abstract). Figure 5 shows an embodiment of the perform comprising a nonwoven layer 20, resin 8, and unidirectional fiber layer 10. The unidirectional fibers may be silicon carbide (col. 4, lines 24-26) and the nonwoven mat may be made of chopped silicon carbide fibers (col. 4, lines 52-55). Multiple plies of the Colegrove et al. invention may be laminated together (col. 5, lines 49-53). The lamination of two preforms of Figure 5 with the nonwoven layers 20 would result in a symmetric article with two nonwoven layer adjacent layers of resin 8, and adjacent two layers of unidirectional layers 10.
- b. Since Tani and Colegrove et al. are from the same field of endeavor (i.e. silicon carbide fiber composites), the purpose disclosed by Colegrove et al. would have been recognized in the pertinent art of Tani.
- c. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the article of Tani and Hillig et al. to include multiple layers of the nonwoven mat of Tani between the layers of directional continuous ceramic fibers. The skilled artisan would have been motivated by the desire to create an article that possesses enhanced thermal properties with the inclusion of additional chopped silicon carbide fibers. The enhanced thermal property allows the composite to have a more uniform thermal expansion, thereby decreasing the thermal stresses that buildup due to mismatched coefficient of thermal expansions between its phases.

Response to Arguments

8. Applicant's arguments filed 3/9/2006 have been fully considered but they are not persuasive.

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9. Applicant argues that Hillig does not teach or suggest a mat as recited by Applicant in claim 1. Applicant's specification teaches the process of creating the chopped fiber mat [0007 and 0022] that includes mixing the chopped fibers with a bonding agent and then formed. The bonding agent is then removed from the fibers. Later in the creation of the claimed article the ceramic matrix fills the voids between the fibers [0023]. Without further structural teaching Examiner maintains his assertion that the mat of Hillig anticipates the instantly claimed mat. The Examiner takes the position that the chopped ceramic fibers that are located in the applied invention's matrix constitute a nonwoven mat of chopped fibers. This is based upon the fact that the matrix contains a plurality of fibers, which are bound together by the matrix creating a mat. This provides the same structure as taught by Applicant. Examiner has also noted that Applicant has taught that the claimed mat comprises as little 10 percent fibers by weight and may have a porosity of up to 90 percent [0022]. Therefore, the vast majority of the mat consists of porous matrix with minimal fiber and this further supports Examiner's assertion that the mat of Hillig anticipates the claimed article. The dictionary definition provided by Applicant has been considered but given little weight in light of what has been taught in Applicant's Specification.

10. Applicant argues that even if the Hillig "mat" anticipates the claimed structure of the nonwoven layer it fails to constitute a dry, porous nonwoven mat. As demonstrated in the Examples of Hillig the final product of Hillig is dry and porous and therefore anticipates the new limitations.

11. Applicant argues that Fareed does not teach or suggest a mat as recited by Applicant in claim 1. Applicant's specification teaches the process of creating the chopped fiber mat [0007 and 0022] that includes mixing the chopped fibers with a bonding agent and then formed. The

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bonding agent is then removed from the fibers. Later in the creation of the claimed article the ceramic matrix fills the voids between the fibers [0023]. Without further structural teaching Examiner maintains his assertion that the mat of Fareed anticipates the instantly claimed mat. The Examiner takes the position that the chopped ceramic fibers that are located in the applied invention's matrix constitute a nonwoven mat of chopped fibers. This is based upon the fact that the matrix contains a plurality of fibers, which are bound together by the matrix creating a mat. This provides the same structure as taught by Applicant. Examiner has also noted that Applicant has taught that the claimed mat comprises as little 10 percent fibers by weight and may have a porosity of up to 90 percent [0022]. Therefore, the vast majority of the mat consists of porous matrix with minimal fiber and this further supports Examiner's assertion that the mat of Fareed anticipates the claimed article. The dictionary definition provided by Applicant has been considered but given little weight in light of what has been taught in Applicant's Specification.

12. Applicant argues that even if the Fareed "mat" anticipates the claimed structure of the nonwoven layer it fails to constitute a dry, porous nonwoven mat. As demonstrated in the Examples of Fareed the final product of Fareed is dry and porous and therefore anticipates the new limitations.

13. Applicant argues that neither Tani nor Hellig teach a dry, porous layer of "nonwoven mat" of chopped fibers. Examiner has already stated his grounds upon which he contends that Hellig does in fact meet the instantly claimed mat as taught by Applicant's specification.

14. Applicant argues that Examiner has failed to assert why it would have been obvious to one ordinary skill in the art at the time the invention was made to have combined the inventions of Tani and Hellig. The skilled artisan would have been motivated by the desire to create an

article that possesses enhanced thermal properties with the inclusion of additional chopped silicon carbide fibers. The enhanced thermal property allows the composite to have a more uniform thermal expansion, thereby decreasing the thermal stresses that buildup due to mismatched coefficient of thermal expansions between its phases.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew D. Matzek whose telephone number is (571) 272-2423. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on (571) 272-1478. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


NORCA TORRES
PRIMARY EXAMINER

mdm

